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MAY 7, 1984
CHEMICAL & ENGINEERING

ACS task force issues recommendations on chemical education Page 34

NEWS

C&EN's Top 50

Page 7

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MAY 7, 1984

News of the Week

■ **National Academy of Sciences seeks new exchange agreement with Soviet scientists.** **Page 4**

■ **Report calls for strengthening of business/educational institution relationships.** **Page 5**

■ **Atom Probe Facility at the University of Pittsburgh begins to operate.** **Page 5**

■ **Unusually dense form of matter made at LBL by high-velocity collisions of niobium nuclei.** **Page 5**

■ **EPA revises its estimate of RCRA-regulated hazardous waste generated in U.S. in 1981.** **Page 6**

■ **NAS adds 60 members to its ranks.** **Page 6**

Business/International

Air Products & Chemicals chairman Edward Donley discusses ways to foster successful market research; chemical companies continue to repurchase stock, increase shares; president-elect Hans van Liemt of DSM on the Dutch firm's specialty chemicals. **Page 16**

Government

House was generous in research funding authorizations but Senate has yet to act; study of binary chemical weapons prompts House debate; conservative thinking dominates meeting on industrial planning, Council for Economic Development report. **Page 23**

Science

Research chemists are increasingly using computer terminals for on-line searching of the chemical literature. **Page 29**

Technology

IBM scientists' fabrication of 1-megabit semiconductor RAM chips may lead to faster and more powerful computers. **Page 31**

Education

ACS task force on chemistry education finds many inadequacies, recommends changes from kindergarten to college level. **Page 34**

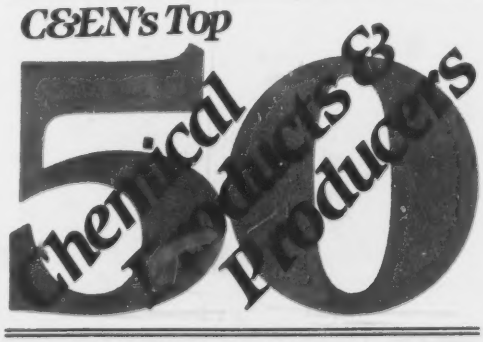
ACS News

University of Illinois, Urbana-Champaign regains its post of top producer of new Ph.D. chemists; ACS Committee on Professional Training reports increases in bachelors, masters, and Ph.D. degrees in ACS-approved colleges during 1982–83. **Page 43**

Letters 2
Editor's Page 3

Concentrates
Business 13
Government 22
Science/Technology 28

The Departments
ACS Comment 40
Awards 50
People 51
Newscripts 66



News Focus

C&EN's Top 50 products, producers benefited from the economic recovery in 1983. **Page 7**

C&EN's Top 50 Chemical Products & Producers

Last year looked bad for U.S. chemical producers. It was characterized by flat prices, layoffs and voluntary retirement programs instituted to avoid outright layoffs, and many plant closings. It also was a year of the leveraged buyout, with many companies getting out of businesses that they deemed unprofitable and selling them to investment groups who thought that they could make them profitable.

However, on final examination, things were not so bad as at first perceived. Granted, pricing was and still remains a problem. Chemical price inflation in the past year generally has been lower than overall U.S. inflation. But increased demand somehow was able to compensate for this, driving chemical sales up from the year before. The actions on employment, plants, and product lines provided increased productivity, which gave the industry enough earnings leverage to nearly double chemical earnings for the top companies from the previous year.

The results of an improving economy are evident in C&EN's annual survey of Top 50 chemicals and Top 50 chemical producers. Production of the Top 50 basic chemicals increased 7.7% in 1983 over 1982. This in no way makes up for the huge drop between 1981 and 1982, but it shows that recovery is moving ahead. Most chemicals contributed to the increase, with organics leading with a 15% increase. Inorganics, hurt by government agriculture policies, still managed a 4.5% gain over the year before.

The improvement also was evident in producers' financial results, with chemical sales increasing about 6% over the year before and operating profit up more than 80% from 1982. In the case of operating profit, this still does not bring the companies back to 1981 levels, but, again, it reflects the general improvement.

Producers now are looking forward to a much better 1984 and, barring unforeseen catastrophe, it looks as if they are going to achieve it. Early results indicate the first quarter of this year went well for the industry. If the improvement continues, the chemical industry may be able to regain all that it has lost in the past few years.

Basic chemical output returns to growth

Top 50 Chemical Products

David Webber, C&EN New York

The U.S. chemical industry ended a three-year production losing streak in 1983. Output of C&EN's Top 50 chemicals, which include both organics and inorganics, increased some 7.7% over 1982. It was an improvement that was welcome to chemical makers, but after 1982's 16% crash it left plenty of ground to be regained.

The overall increase also masks the unevenness of the recovery. Of the 50 products, output rose in 36 cases and fell in 14. Organic chemicals, which had slipped the worst in 1982, rebounded at a 15% rate. Inorganic chemicals, on the other hand, registered only a 4.5% increase in production. In 1982, by contrast, output of virtually every one of the Top 50 products declined. In addition, the rate of decline was fairly evenly distributed in that recession year: Organics production fell 18%; inorganics production, 16%.

The relative tepidity of the production recovery—compare it with a 9.2% increase in 1976 after the big 1975 recession—means that industry's long-term performance, already looking very lackluster last year, remains just as dull. Over the past five years, annual output actually has fallen a total of 1%. That compound rate, for the 1978-83 period, matches the decline for 1977-82, the first five-year period ever in which the chemical industry recorded such a reverse. Nor has even longer-term performance been more encouraging. Since 1973, production has been essentially flat. Organic chemicals have managed a meager 1.5% compound annual growth rate, whereas inorganics, which account for over twice the poundage of the organic segment of the Top 50 list, have grown at an overall rate of just 0.7% during the decade.

The 7.7% production increase also fails to match the rise of the Federal Reserve Board's industrial production index for all basic chemicals—a wider product

About the Top 50 list of chemical products

Government data, trade association figures, and industry estimates all go into preparing C&EN's annual list of the Top 50 chemical products, ranked by production volume. The federal government is relied upon most heavily, but when government figures are not available, other sources, primarily trade associations, are used. Industry sources and C&EN estimates are used only when other data are lacking.

Government data are not always accurate—they are only as good as the information that individual companies report. But they are an objective measure of production extending back for many years. Therefore, relatively accurate indications of growth can be made on a consistent basis.

At this time of year, C&EN has access only to preliminary reports of production for 1983. When the government and trade associations issue their final reports, the outcome can be changed, sometimes dramatically. As a result, production figures for 1981 that appear in the table on page 9 are different in some cases from those published in last year's Top 50 report. The final reports also can affect the rankings of chemicals. The 1982 rankings of 32 of the chemicals listed in the table, for example, are different from those in the similar table published by C&EN a year ago.

The list itself covers production figures for the U.S. and includes chemicals produced for export. Candidates for the list include all basic, intermediate, and chemically homogeneous finished products. These range from chemical building blocks such as ethylene and propylene to downstream products such as vinyl acetate and ethylene glycol.

The roster also includes basic inorganic chemicals, but does not include what C&EN considers to be minerals, such as salt, gypsum, and sulfur. Lime is included because it is processed and has many chemical and industrial applications. Refractory (dead-burned) dolomite is excluded in the calculations of lime production. This year potash is included for the first time.

In the organics list, such petrochemical feedstocks as ethane, butane, and propane are excluded arbitrarily, because they are considered to be products of oil companies and because they have many nonchemical uses.

There are other gray areas besides lime and petrochemical feedstocks. For example, the basic aromatics—benzene, toluene, and xylene—are included. Admittedly, this makes the list less pure chemically.

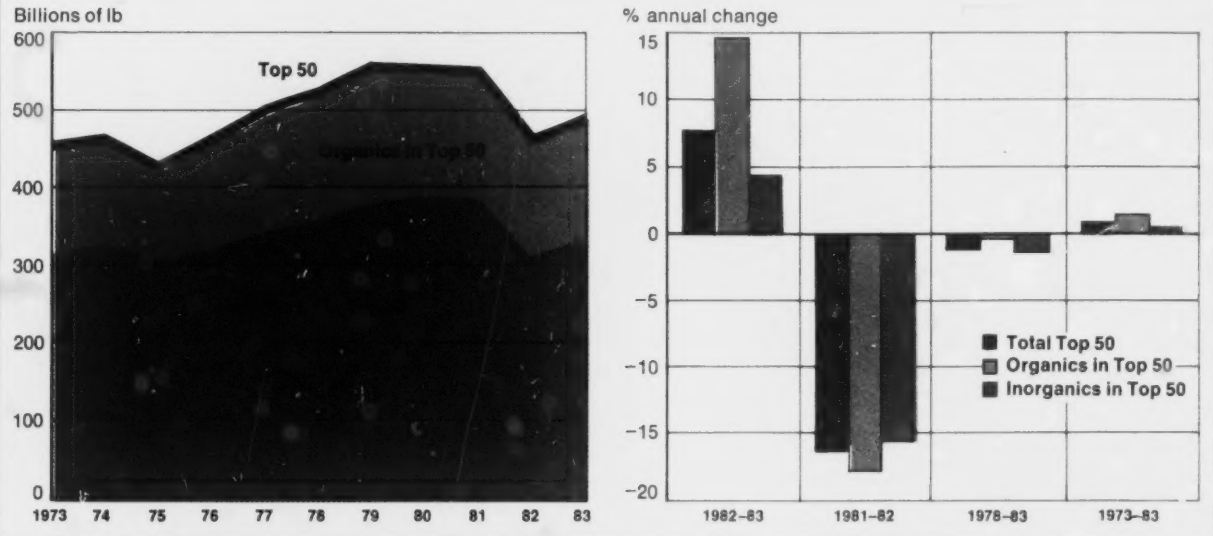
Production figures are published by the government and trade associations in a variety of units—millions of pounds, thousands of tons, billions of cubic feet, millions of gallons, metric tons. To provide an accurate ranking and to make comparison of production volumes easier, C&EN not only gives production in common units but converts production to billions of pounds as well.

Top 50 chemical output rose for the first time in four years

Rank 1983	Rank 1982[a]		Billions of lb 1983	Billions of lb 1982	Common units[b] 1983	Common units[b] 1982	Average annual growth 1982–83	1981–82	1978–83	1973–83
1	1	Sulfuric acid	69.45	65.36	34,725 tt	32,680 tt	6.3%	−19.7%	−3.3%	0.8%
2	2	Nitrogen	42.03	35.07	580 bcf	484 bcf	19.8	−1.2	8.2	9.8
3	5	Lime[c]	28.80	28.15	14,400 tt	14,075 tt	2.3	−25.5	−5.8	−3.2
4	4	Oxygen	28.73	28.81	347 bcf	348 bcf	−0.3	−19.3	−4.1	−1.1
5	6	Ethylene	28.59	24.50	28,586 mp	24,501 mp	16.7	−16.7	1.9	2.5
6	3	Ammonia	27.37	31.56	13,683 tt	15,778 tt	−13.3	−17.1	−4.5	−1.1
7	7	Sodium hydroxide	20.46	18.77	10,230 tt	9,385 tt	9.0	−9.9	−2.0	−0.5
8	8	Chlorine	19.92	18.35	9,960 tt	9,176 tt	8.5	−14.8	−2.1	−0.4
9	9	Phosphoric acid	19.90	16.52	9,950 tt	8,262 tt	20.4	−16.7	1.2	3.7
10	10	Sodium carbonate[d]	16.93	15.64	8,467 tt	7,819 tt	8.3	−5.6	4.6	1.2
11	11	Nitric acid	14.75	14.78	7,373 tt	7,390 tt	−0.2	−18.2	−1.5	−1.3
12	14	Propylene	13.98	12.54	13,984 mp	12,535 mp	11.6	−7.0	1.4	3.5
13	12	Ammonium nitrate[e]	13.24	14.18	6,618 tt	7,091 tt	−6.7	−19.3	−1.7	−0.9
14	13	Urea[f]	11.54	13.04	5,770 tt	6,518 tt	−11.5	−19.6	−1.7	5.2
15	16	Ethylene dichloride	11.25	7.62	11,247 mp	7,619 mp	47.6	−23.6	0.4	1.9
16	15	Benzene	9.48	7.75	1,287 mg	1,052 mg	22.3	−19.5	−2.9	−1.2
17	19	Ethylbenzene	7.86	6.66	7,857 mp	6,656 mp	18.0	−14.8	−1.3	3.3
18	18	Carbon dioxide[g]	7.15	7.36	3,574 tt	3,682 tt	−2.9	−2.9	2.4	8.6
19	21	Toluene[h]	7.12	5.18	981 mg	714 mg	37.4	−16.2	−1.4	0.2
20	20	Styrene	6.99	5.94	6,987 mp	5,942 mp	17.6	−11.0	−0.6	1.6
21	24	Vinyl chloride	6.95	4.90	6,950 mp	4,902 mp	41.8	−28.7	0.0	2.6
22	17	Methanol	6.62	7.56	6,624 mp	7,555 mp	−12.3	−11.9	0.6	−0.6
23	25	Terephthalic acid[i]	5.69	4.84	5,688 mp	4,843 mp	17.4	−22.3	−0.9	4.0
24	22	Ethylene oxide	5.58	4.99	5,575 mp	4,987 mp	11.8	−2.4	2.2	3.0
25	27	Xylene	5.57	4.74	773 mg	658 mg	17.5	−25.3	−1.8	−0.2
26	26	Formaldehyde[j]	5.40	4.82	5,398 mp	4,817 mp	12.1	−15.8	−3.3	−1.7
27	23	Hydrochloric acid	5.22	4.92	2,608 tt	2,460 tt	6.0	−1.7	−1.3	0.4
28	28	Ethylene glycol	4.46	4.31	4,460 mp	4,309 mp	3.5	4.0	2.7	3.1
29	31	*p*-Xylene	4.11	3.21	4,109 mp	3,207 mp	28.1	−29.2	3.2	5.9
30	30	Ammonium sulfate	3.94	3.54	1,968 tt	1,768 tt	11.3	−16.2	0.3	−0.1
31	33	Cumene	3.30	2.74	3,304 mp	2,743 mp	20.5	−17.1	−0.5	2.2
32	29	Potash[k]	2.87	3.93	1,300 tmt	1,784 tmt	−27.1	−17.3	−10.4	−6.7
33	32	Acetic acid	2.79	2.75	2,794 mp	2,748 mp	1.7	−10.6	0.1	1.4
34	37	Phenol[l]	2.61	2.02	2,612 mp	2,023 mp	29.1	−21.5	−0.5	1.5
35	35	Carbon black	2.50	2.30	2,496 mp	2,302 mp	8.4	−15.7	−5.7	−3.3
36	38	Butadiene[m]	2.31	1.92	2,312 mp	1,915 mp	20.7	−35.9	−8.0	−4.4
37	34	Aluminum sulfate	2.29	2.37	1,144 tt	1,186 tt	−3.5	−8.3	−2.7	−0.7
38	36	Acrylonitrile	2.15	2.04	2,146 mp	2,035 mp	5.5	2.0	4.1	4.7
39	39	Vinyl acetate	1.96	1.88	1,962 mp	1,876 mp	4.6	−3.1	3.0	2.7
40	40	Calcium chloride[n]	1.88	1.75	942 tt	875 tt	7.7	−20.2	−1.8	−1.4
41	42	Acetone	1.87	1.69	1,873 mp	1,694 mp	10.6	−21.0	−5.8	−0.6
42	41	Sodium sulfate[o]	1.71	1.73	854 tt	864 tt	−1.2	−25.8	−6.1	−5.1
43	48	Cyclohexane	1.69	1.28	1,688 mp	1,275 mp	32.4	−29.9	−6.3	−2.3
44	43	Propylene oxide	1.58	1.48	1,581 mp	1,477 mp	7.0	−14.8	−5.0	−1.0
45	46	Titanium dioxide	1.51	1.31	757 tt	657 tt	15.2	−13.7	1.5	−0.4
46	45	Sodium silicate	1.45	1.33	726 tt	664 tt	9.3	−13.9	−2.6	0.0
47	49	Adipic acid	1.42	1.20	1,415 mp	1,197 mp	17.0	−1.1	−2.9	−1.1
48	47	Sodium tripolyphosphate	1.34	1.30	669 tt	651 tt	2.8	−6.5	−2.0	−3.6
49	44	Isopropyl alcohol	1.21	1.38	1,212 mp	1,380 mp	−12.2	−17.3	−6.9	−4.1
50	50	Ethanol	1.10	1.02	1,104 mp	1,023 mp	7.9	−22.3	−2.7	−5.6
TOTAL ORGANICS			**165.17**	**143.96**			**14.7%**	**−17.9%**	**−0.1%**	**1.5%**
TOTAL INORGANICS			**333.41**	**319.04**			**4.5%**	**−15.6%**	**−1.5%**	**0.7%**
GRAND TOTAL			**498.58**	**463.00**			**7.7%**	**−16.3%**	**−1.0%**	**0.9%**

a Revised. b tt = thousands of tons, bcf = billions of cubic feet, mp = millions of pounds, mg = millions of gallons, tmt = thousands of metric tons. c Except refractory dolomite. d Synthetic and natural. e Original solution. f 100% basis. g Liquid and solid only. h All grades. i Includes both acid and ester without double counting. j 37% by weight. k K_2O basis. l Synthetic only. m Rubber grade. n Solid and liquid. o High and low purity. **Sources:** Bureau of the Census, Bureau of Mines, International Trade Commission, C&EN estimates

Production of basic chemicals bounced back in 1983



sample. In 1983, the board's basic chemicals output index climbed almost 12%. Its industrial production index for all chemicals and allied products rose 9.7%.

There are other differences between the 1983 recovery and that in 1976. In the earlier recovery year, production rose sharply enough to regain nearly all the ground lost in the 1975 slump. All the improvement of 1983, on the other hand, still leaves total output for the Top 50 chemicals well below the 1981 total. In fact, excepting 1982, it is necessary to go back to 1976 to find an annual production total lower than 1983's.

Still, for many individual chemical products, 1983 marked a sharp rebound in production. Ten of the Top 50, in fact, recorded growth of 20% or more over the previous year. The biggest gainer was ethylene dichloride, one of the bigger losers in 1982. EDC output rose 48% last year. Following in order of production increases were vinyl chloride, up 42%; toluene, up 37%; cyclohexane, up 32%; phenol, up 29%; *p*-xylene, up 28%; benzene, up 22%; butadiene, up 21%; cumene, up 21%; and phosphoric acid, up 20%.

The 10 chemicals with the worst output record in 1983 were potash, down 27%; ammonia, down 13%; methanol, down 12%; isopropyl alcohol, down 12%; urea, down 12%; ammonium nitrate, down 7%; aluminum sulfate, down 4%; carbon dioxide, down 3%; sodium sulfate, down 1%; and oxygen, down slightly. The preponderance of fertilizer materials on the list reflects last year's drought and payment-in-kind (PIK) program. The industrial gases on the list were hurt by the poor performance of the U.S. steel producing industry.

Analysis of long-term production trends, on the other hand, spotlights a number of different chemical products. Over the past 10 years, for example, the fastest-growing products have been industrial gases. Of these, nitrogen has grown the most, with nearly a 10% annual compound growth rate between 1973 and 1983. Not only did nitrogen output increase just under 20% last year, its 1.2% decline in the 1982 recession was one of the lowest in the Top 50 group.

Close behind nitrogen in long-term performance is carbon dioxide, production of which grew at a 9% annual compound rate over the past 10 years. Unlike nitrogen, however, which grew during the recession-racked 1978–83 period almost as fast as during the 10-year span, carbon dioxide production increased at an annual rate of just 2% over the past five years. In each of the past two years, production decreased nearly 3%.

The other top chemicals in terms of production growth over the past decade are *p*-xylene, up 6% a year; urea, up 5% a year despite its dismal performance over the past two years; acrylonitrile, up 5% a year; terephthalic acid, phosphoric acid, and propylene, each up 4%; and ethylbenzene, ethylene glycol, and ethylene oxide, each up 3%.

There are probably no surprises in the list of the five worst performers since 1973. Potash production has shrunk at an annual compound rate of nearly 7% over the decade. Ethanol output has declined 6% a year. Following are sodium sulfate, down 5% a year; butadiene, down 4% a year; and isopropyl alcohol, down 4% a year.

The unevenness of the recovery last year resulted in only a few noticeable changes in the ranking of the Top 50 chemicals. Lime moved from fifth to third position, and ammonia fell from third to sixth. Vinyl chloride jumped from 24 to 21; potash dropped from 29 to 32. Cyclohexane shot up from 48 in 1982 to 43 last year, whereas isopropyl alcohol dropped from 44 to 49. Ethanol retained its grasp on 50th place, and sulfuric acid remained unchallenged in first place. □

Profits up for largest chemical producers

Top 50 Chemical Producers

William J. Storck, C&EN New York

The fortunes of the chemical industry were buoyed tremendously by the economy in general last year as two industries that provide markets for chemical end products—housing and autos—finally got back on track. Housing picked up once again as interest rates declined, making mortgages once again affordable. And the declining interest rates and the aging automobile population gave new life to the auto industry—a resurgence that is continuing into 1984 as auto makers are reporting their highest profits in years.

The result of these upturns was increased demand for fibers and plastics, two big contributors to the fortunes of the chemical industry.

The one nagging problem that remained throughout the year for many U.S. chemical producers was in agricultural chemicals. Many manufacturers of pesticides and almost all fertilizer makers suffered in 1983 because of the government's payment-in-kind (PIK) program to pull crop acreage out of production. The result of this program was evident in many companies such as W. R. Grace, Stauffer Chemical, Williams Cos., and Eli Lilly, all of which had declining chemical operating profits if not outright deficits.

The year was good enough, however, that 32 of 49 companies on C&EN's list of the 50 largest chemical producers (in terms of chemical sales) posted sales gains in 1983 over 1982. (Stauffer was excluded because, during the year, it changed its fiscal year and did not restate prior data to reflect the change, making comparisons meaningless if not impossible.) In last year's listing, every company on the list recorded a sales decline in 1982 from the previous year.

Combined 1983 chemical sales for the Top 50 companies (excluding Stauffer) increased 6.3% over 1982 to $101 billion. Most striking, however, is that operating profits (sales minus administrative expenses and costs of selling) for chemicals for the companies reporting such data increased 87% from 1982 to $6.60 billion. As a result, operating profit margins for the group increased to 6.7% from 3.8% the year before.

Once again, Du Pont won the honor of being the U.S.'s largest chemical producer, with $11.6 billion in chemical sales in 1983, up about 33% from 1982. The second to fifth largest producers retained the same ranking as last year and were, respectively, Dow Chemical, with $8.88 billion in chemical sales; Exxon, with $8.44 billion; Monsanto, with $5.77 billion; and Union Carbide, with $3.91 billion.

Most of the companies in the Top 50 gained or slipped a notch or two in this year's ranking, but a few shifted more dramatically. For instance, Mobay rose to 22 from 30 last year, and Goodrich rose to 30 from 34. On the other hand, sales declines sent some companies lower on this year's list, including Phillips Petroleum to 14 from 10 last year, and Williams Cos. to 45 from 40.

Three companies are new to the Top 50 ranking this year. Borg-Warner moved up to 40th place in 1983 from 52 among chemical manufacturers in 1982. Georgia-Pacific also rose in rank to 47 from 51 last year, and Badische moved up to 48 from 57.

Likewise, three companies dropped off the list, but none because of declining sales. El Paso was acquired by Occidental Petroleum and Getty by Texaco. Tenneco was dropped from the list because it now lumps its much diminished chemical operations in with its refining and marketing operations, giving a picture of sales at least three to four times what they actually are. Tenneco might have dropped out of the Top 50 ranking anyway, after selling much of its chemical operations. If the other two companies had been able to report their results, Nalco Chemical and Merck certainly would not have been on the Top 50 list this year.

Other large chemical producers aren't included on the list, because they do not break out chemical sales in a manner that gives an honest picture of their operations. Chief among these is General Electric, for which as much as 10% of its total 1983 sales of $26.8 billion may be in chemical and plastics markets. Procter & Gamble, with its huge operations in detergent chemicals, also falls into this group. Then, too, there are some companies such as Texasgulf and Akzona that, because of acquisition by foreign firms, no longer report chemical sales in the U.S.

Even the companies on the Top 50 list are not pure in reporting their chemical sales. Many of the companies include large amounts of nonchemical products in the chemical breakouts. On the other side of the coin are companies that do not give a complete report of all of their chemical sales in their financial reports. PPG Industries certainly would rank higher than it does if all chemical sales were broken out. And Witco Chemical probably would make the Top 50 listing if some of its chemical sales were not hidden in other divisions. Probably the best example of this, however, is Occidental Petroleum. Occidental lumps its huge fertilizer operations into a business segment called Agribusiness, which also includes its even larger slaughterhouse operations. □

Chemical sales, earnings increase for most top U.S. producers

Rank 1983	Rank 1982[a]	Company	Chemical sales 1983 ($ millions)	Change from 1982	Chemical sales as % of total sales	Industry classification	Chemical operating profit 1983[b] ($ millions)	Change from 1982	Chemical operating profits as % of total operating profit	Operating profit margin[c]	Chemical assets 1983	Chemical assets as % of total assets	Operating return on chemical assets[d]
1	1	Du Pont	$11,607	6.4%	32.8%	Diversified	$1144	171.7%	26.2%	9.9%	$7591	31.1%	15.1%
2	2	Dow Chemical	8,875	8.1	81.0	Basic chemicals	573	153.5	111.0	6.5	8193	68.4	7.0
3	3	Exxon	8,439	39.5	7.5	Petroleum	348	640.4	3.9	4.1	4852	7.9	7.2
4	4	Monsanto	5,771[e]	11.8	92.6	Basic chemicals	568	8.4	102.3	9.8	4498	70.0	12.6
5	5	Union Carbide	3,912	−2.5	43.5	Basic chemicals	285	108.0	42.0	7.3	4917	47.8	5.8
6	7	Celanese	3,261	6.5	100.0	Basic chemicals	214	448.7	100.0	6.6	2869	100.0	7.5
7	6	Shell Oil	3,227	4.6	16.4	Petroleum	130	def	4.2	4.0	3759	17.0	3.5
8	8	Standard Oil (Ind.)	2,906	4.3	9.9	Petroleum	173	30.1	4.8	6.0	2445	9.6	7.1
9	9	W. R. Grace	2,760	5.3	44.4	Specialty chemicals	324	3.5	62.3	11.7	1641	32.6	19.7
10	11	Atlantic Richfield	2,550	13.8	9.8	Petroleum	64	def	2.4	2.5	2603	11.2	2.5
11	14	Allied	2,337	9.1	23.3	Diversified	224	69.7	20.3	9.6	1299	17.0	17.2
12	13	Mobil	2,331	8.5	4.0	Petroleum	−16	def	def	def	2266	6.5	def
13	12	Eastman Kodak	2,285	6.2	22.5	Photo equipment	214	4.4	20.8	9.4	2124	19.4	10.1
14	10	Phillips Petroleum	2,255	−4.3	14.8	Petroleum	83	260.9	3.2	3.7	1413	10.8	5.9
15	15	Hercules	2,007	−1.6	76.3	Basic chemicals	121	61.3	66.1	6.0	1204	55.4	10.0
16	17	Rohm & Haas	1,808	4.7	96.4	Basic chemicals	298	91.0	108.8	16.5	1038	68.7	28.7
17	16	Gulf Oil	1,748	−12.9	6.2	Petroleum	−76	def	def	def	1009	4.8	def
18	18	American Cyanamid	1,719	1.3	48.6	Basic chemicals	106	6.0	36.5	6.2	1275	41.7	8.3
19	20	Ethyl	1,478[e]	4.7	84.7	Basic chemicals	156	2.6	84.1	10.6	901	83.4	17.3
20	21	Air Products[f]	1,412	3.9	86.4	Basic chemicals	196	2.4	96.2	13.9	1654	74.5	11.8
21	19	Stauffer Chemical	1,340	nm	100.0	Basic chemicals	−14	def	def	def	2048	100.0	def
22	30	Mobay	1,300	15.0	100.0	Basic chemicals	66[h]	def	100.0	5.1	na	na	na
23	22	FMC	1,296	−1.8	37.0	Machinery	169	13.3	61.3	13.0	1063	38.2	15.9
24	25	Borden	1,295[e]	6.2	30.4	Dairy products	138	60.9	37.3	10.6	1325	48.7	10.4
25	23	Ciba-Geigy	1,290	0.3	65.1	Specialty chemicals	na	na	na	na	na	na	na
26	28	American Hoechst	1,222[e]	3.0	75.2	Basic chemicals	na	na	na	na	na	na	na
27	27	Ashland Oil	1,208	0.9	14.9	Petroleum	1	−96.4	0.5	0.1	423	10.3	0.2
28	40	Occidental Petroleum	1,137[g]	−10.1	5.8	Petroleum	−12	def	def	def	985	8.4	def
28	26	Texaco	1,137	−6.1	2.8	Petroleum	−65	def	def	def	895	3.3	def
30	34	B. F. Goodrich	1,133	11.6	35.5	Rubber products	44	3927.3	43.9	3.9	1214	47.1	3.6
30	29	Unocal Corp.	1,133	−1.7	10.7	Petroleum	74[h]	−17.3	11.8	6.5	699	7.6	10.6
32	31	U.S. Steel	1,128	4.7	6.4	Steel	−27	def	def	def	1130	5.9	def
33	36	Olin	1,111	9.7	57.4	Basic chemicals	68	21.5	44.9	6.1	1002	54.8	6.8
34	32	Standard Oil of Calif.	1,059	1.1	3.7	Petroleum	−12[h]	def	def	def	780	3.8	def
35	38	BASF Wyandotte	1,034	15.6	100.0	Basic chemicals	20	def	100.0	1.9	726	100.0	2.7
36	35	International Minerals[i]	997	−1.6	68.2	Agrichemicals	156	−7.6	81.1	15.7	1377	70.8	11.4
37	33	Diamond Shamrock	942	−9.0	23.4	Petroleum	12	−83.2	def	1.3	1063	17.6	1.1
38	39	PPG Industries	882	−1.2	24.0	Glass products	51	30.8	11.8	5.8	1152	31.9	4.4
39	37	CF Industries	862[e]	−6.2	100.0	Agrichemicals	34	def	100.0	4.0	1013	100.0	3.4
40	52	Borg-Warner	826	34.8	23.5	Auto equipment	110	112.7	35.2	13.3	365	13.9	30.2
41	41	Lubrizol	800	−1.5	100.0	Specialty chemicals	109	5.1	100.0	13.6	683	100.0	15.9
42	44	National Distillers	785	14.6	30.3	Alcoholic beverages	68	86.5	41.6	8.6	683	34.6	9.9
43	46	Dow Corning	763	15.1	100.0	Specialty chemicals	68[h]	29.1	100.0	9.0	na	na	na
44	43	Reichhold Chemicals	747	−5.0	100.0	Basic chemicals	35	137.9	100.0	4.6	371	96.4	9.3
45	40	Williams Cos.	740	−10.7	34.1	Agrichemicals	1	def	0.6	0.1	894	19.1	0.1
46	42	Eli Lilly	727	−7.8	24.0	Drugs	98	−33.4	12.4	13.5	793	837.8	12.3
47	51	Georgia-Pacific	683	8.8	10.6	Wood products	64	−16.9	61.0	9.4	1023	20.5	6.3
48	57	Badische	671	33.9	100.0	Basic chemicals	30	def	100.0	4.4	513	100.0	5.7
49	47	Nalco Chemical	659	2.4	100.0	Specialty chemicals	118	19.0	100.0	17.8	489	100.0	24.0
50	49	Merck	606	−5.1	18.7	Drugs	52	−11.7	7.3	8.6	592	14.0	8.8

a Revised. **b** Operating profit defined as sales less administrative expense and cost of selling. **c** Operating profit as a percentage of chemical sales. **d** Operating profit as a percentage of identifiable chemical assets. **e** Chemical sales include significant amounts of nonchemical products. **f** Fiscal year ended Sept. 30, 1983. **g** Does not include all chemical products. **h** Chemical net profits. **i** Fiscal year ended June 30, 1983. **na** = not available. **nm** = not meaningful. **def** = deficit.

als trained in a broader, more varied range of professional disciplines so that the collective brain of the corporation can cope with this more complex world that we live in.

C&EN: Are you acting upon this at Air Products?

Donley: Yes. We are. It's a cultural change that we're forcing upon ourselves. I talked to a group of engineers here not long ago, and one guy said, "Donley wants us to hire flute players," which was intended as a joke, but which nevertheless showed a sort of bias in favor of the engineering discipline. Now I'm an engineer myself, so I'm not going to put down the importance of engineering and technology, but that's not enough for the future.

C&EN: Looking back on the past, there's always been this alternating love-hate relationship between business and liberal arts people. Is this just the cycle coming around again, or is there something new here?

Donley: I think there's something new in that the external conditions in the world are different. To be able to make expert, intelligent judgments about the future both here at home and in the markets we serve overseas, we have to understand those cultures and political systems and economic systems and so forth to a greater extent than we had to before. I know there's always been this, as you call it, love-hate relationship: C. P. Snow called it the "two cultures." The world won't permit us to thrive anymore unless we meld these two cultures together.

C&EN: During the past recession, many companies reduced their market research effort. What have you done?

Donley: Our market research has expanded. I think reducing it is a fatal mistake. There are certain things that we think you have to believe in like religion. One is research—both physical and market—and the other is human resources recruiting. People have a tendency to open and close those valves depending on outside economic conditions. We think that's really adverse to the long-term vitality of the company. We haven't cut back the effort or the commitment.

Maybe I see a silver lining in a dark cloud, but I think this recession taught U.S. management to look more rigorously at what we're doing—whether we are, in fact, responding to markets with enough insight and sensitivity, whether we have become bureaucratic in our companies, whether we have more layers of management than we need. Certainly here at Air Products we have had forced upon us by the economic conditions a heightened sensitivity in those regards. We've learned from the recession. □

Stock maneuverings are rife in chemicals

During the first four months of this year, a broad range of chemical companies have been attempting to repurchase large amounts of their own common and preferred stock. Other companies have increased the authorized number of common shares or added authorization for new classes of preferred stock. Still others have arranged to sell new stock to exchange for debt.

The active deployment of stock for financial and other purposes continues a trend begun last year. Such repurchases typically are made to cover employee stock option plans. When stock prices are considered low, as many chemical stocks now are, companies may repurchase shares as an investment. Since reducing the number of outstanding shares automatically raises earnings per share, companies also may make such moves in an effort to shore up the price of their stock. Repurchasing stock and increasing the number of authorized but not issued preferred shares can buttress a corporation's defenses against an unwelcome takeover bid as well.

In new programs announced recently, such firms as American Cyanamid, Celanese, Chemed, Church & Dwight, Dart & Kraft, Loctite, Olin, SmithKline Beckman, and Stauffer Chemical made offerings to rebuy common stock. Allied, Koppers, Reichhold Chemicals, and Sherwin-Williams announced they would repurchase preferred shares.

Nalco Chemical quadrupled its authorized number of preferred shares to 2 million and common stock from 60 million to 100 million. Owens-Corning Fiberglas doubled its authorized common stock pool to 100 million shares and approved a new class of 8 million shares of preferred stock.

In equity-for-debt swaps, Borg-Warner moved to sell up to 350,000 new shares of common stock to exchange for a $6.1 million promissory note held by Goldman Sachs, and Reichhold will issue up to 350,000 new shares of common stock or pay cash in exchange for debt.

David Webber, New York

Stock repurchase continues apace in early 1984

	Number of shares	Value[a] ($ millions)
REPURCHASING COMMON STOCK		
American Cyanamid	500,000	$ 24.0
Celanese	750,000	53.8
Chemed[b]	171,000[a]	6.0
Church & Dwight	250,000	5.6
Dart & Kraft	5,000,000	347.5
Loctite	500,000	18.0
Olin[c]	1,000,000	29.1
SmithKline Beckman[d]	3,000,000	162.8
Stauffer Chemical	700,000	13.8
REPURCHASING PREFERRED STOCK		
Allied	e	150.0
Koppers[f]	500,000	51.0
Reichhold Chemicals	g	g
Sherwin-Williams[h]	10,500	1.1

a Based on approximate market value of shares at time of announcement. b Since 1980, company has spent $7.5 million on stock repurchase. New authorization is in addition to previous program. c Repurchased 175,000 "odd-lot" shares in December and January in offer to buy 600,000 such shares. d In addition to 3 million share repurchase program authorized in January. e Will be made on open market or through private transactions. Company previously repurchased $148 million of these shares. f In 1983 and first-quarter 1984, company repurchased 190,400 shares of total 559,600 outstanding. g Will repurchase at discount from $100 stated value. h Redemption price is $100 per share plus accrued dividends.

Urbana, Chapel Hill top graduate rankings

The University of Illinois, Urbana-Champaign, has regained its almost traditional position as the largest producer of new Ph.D. chemists in this country. And the University of North Carolina, Chapel Hill, remains the leading producer of bachelor's degree chemistry graduates.

These are two of the findings gleaned by C&EN from the latest annual report by ACS's Committee on Professional Training. The report, which is presented in full starting on page 44, covers the 1982-83 academic year. CPT is the mechanism through which ACS monitors, and sets standards for, chemistry undergraduate programs.

Urbana-Champaign has been the largest producer of Ph.D. chemists for eight of the past 10 years. It yielded to the University of California, Berkeley, which is second on the latest listing, in 1979-80 and 1981-82.

Chapel Hill has been even more dominant, being the largest producer of new bachelor chemistry graduates for nine of the past 10 years. In 1979-80 it yielded to Indiana University. Indiana has remained in the second position since.

The University of Michigan, Ann Arbor, is the new leader of the list of producers of certified bachelor graduates. It displaces Rutgers University, New Brunswick. The University of California, San Diego, headed this list for the previous eight years. Certified graduates have completed a curriculum certified by CPT and are immediately eligible for ACS membership.

The new report also sheds light on the growing penetration of the chemical profession by women over the past decade. In 1982-83, 33% of new bachelor's degree chemists were women. This is up from 18% 10 years earlier. The corresponding figures for new Ph.D. chemists are 17% and 10%. The gains in chemical engineering have been relatively even greater. In 1982-83, 23% of new bachelor's degree chemical engineers were women. This compares with 3% in 1972-73.

These schools had the most chemistry graduates, 1982-83

Total bachelor graduates

1. U of North Carolina, Chapel Hill	136
2. Indiana U, Bloomington	120
3. U of Illinois, Urbana-Champaign	113
4. U of California, Los Angeles	109
5. Emory U	108
6. U of Miami	96
7. U of Pittsburgh	95
8. U of Maryland, College Park	89
9. U of Washington	77
10. Duke U	76
11. U of Michigan, Ann Arbor	75
12. U of South Florida	74
13. U of Virginia	72
14. U of Florida	71
15. Miami U	67
16. U of California, Berkeley	64
16. U of Colorado, Boulder	64
18. U of Georgia	63
19. U of California, San Diego	59
19. U of Puerto Rico, Rio Piedras	59
21. Rutgers U, New Brunswick	58
22. State U of New York, Stony Brook	57
22. U of Texas, Austin	57
24. Youngstown State U	56
25. Cornell U	53

Certified bachelor graduates

1. U of Michigan, Ann Arbor	75
2. U of California, Berkeley	60
3. U of California, San Diego	59
3. U of Washington	59
5. U of Texas, Austin	57
6. U of Illinois, Urbana-Champaign	51
7. Rutgers U, New Brunswick	46
8. U of California, Los Angeles	44
9. Illinois State U	41
10. U of North Carolina, Chapel Hill	40
11. Massachusetts Inst. of Tech	39
12. U of California, Davis	37
13. U of Delaware	35
14. Rensselaer Polytechnic Inst.	34
15. C of William & Mary	32
16. U of California, Santa Cruz	30
16. Miami U	30
16. Texas A&M U	30
19. C of the Holy Cross	29
19. Purdue U	29
21. Arizona State U	28
21. U of Arizona	28
21. Indiana U, Bloomington	28
24. Carnegie-Mellon U	27
24. Cornell U	27
24. Michigan State U	27
24. Ohio State U	27
24. U of Vermont	27

Masters graduates

1. Cornell U	45
2. Princeton U	33
3. U of Illinois, Chicago	26
3. Northwestern U	26
3. U of Rochester	26
3. Yale U	26
7. U of Arizona	22
8. U of Scranton	21
9. U of Michigan, Ann Arbor	20
10. California State U, Long Beach	18
10. U of California, San Diego	18
10. U of Illinois, Urbana-Champaign	18
13. U of Cincinnati	17
13. Columbia U	17
13. U of Washington	17
16. New York U	16
17. U of Pittsburgh	15
18. Stevens Institute of Tech	14
18. Villanova U	14
18. Wright State U	14
21. Michigan State U	13
21. Seton Hall U	13
23. U of California, Berkeley	12
23. U of Florida	12
23. U of Georgia	12
23. Indiana U, Bloomington	12

Doctoral graduates

1. U of Illinois, Urbana-Champaign	66
2. U of California, Berkeley	58
3. Massachusetts Inst. of Tech	41
4. U of Wisconsin, Madison	37
5. Purdue U	34
6. Michigan State U	33
7. U of North Carolina, Chapel Hill	32
8. Indiana U, Bloomington	29
8. Texas A&M U	29
10. U of California, Los Angeles	28
10. U of California, San Diego	28
12. U of Florida	27
12. Harvard U	27
12. Ohio State U	27
15. Yale U	26
16. California Institute of Tech	25
17. U of Arizona	24
17. U of Cincinnati	24
17. U of Texas, Austin	24
20. U of Chicago	23
20. Cornell U	23
20. U of Nebraska, Lincoln	23
20. Pennsylvania State U	23
24. Iowa State U	22
24. U of Massachusetts	22

ACS Committee on Professional Training 1983 Annual Report

The number of bachelor's degree graduates in chemistry from colleges and universities whose undergraduate chemistry programs are approved by the American Chemical Society increased 1.8% in the 1982–83 academic year from the previous year. The number of master's degrees from these departments decreased 4.6%, and the number of Ph.D. degrees continued to rise for the fourth year in a row, this year 4.5%.

The percentage of baccalaureate graduates certified by ACS was again 42%. (Certified graduates are those who have completed the curriculum specified by the Committee on Professional Training and are eligible for full membership in ACS; noncertified graduates may become associate members of ACS upon graduation and full members after three years of professional experience or a higher degree in chemical science.)

A total of 2473 of the bachelor's degree graduates from the approved schools were reported as planning to go to graduate school, and 1973 reported plans to go to professional schools.

Total numbers of bachelor's degrees (certified and noncertified), master's degrees, and Ph.D. degrees awarded in 1982–83 by departments whose chemistry programs are ACS approved are listed by institution in the large table at the end of this report and are summarized in the two smaller tables. These tables also include numbers of chemical engineering graduates from institutions whose programs are accredited by the American Institute of Chemical Engineers and the Accreditation Board for Engineering & Technology. (Note: Those departments are not required to report their data to CPT, so the number of departments included varies each year.) Included for the second year is a table with information on graduate student enrollments in chemistry departments whose undergraduate programs are ACS approved.

The number of bachelor's degrees in chemical engineering from the 122 AIChE-ABET-accredited departments that reported in 1983 increased 17.7% from the total reported by 113 departments in 1982. These 122 departments reported an expected further increase of 4.9% in 1984. During the five-year period 1979–83, the number of reported bachelor's degree graduates in chemical engineering increased 41%. At the graduate level, the number of chemical engineering master's degrees reported in 1983 rose 12.5% from the year before, and the number of Ph.D. degrees reported increased 13.7%.

Programs at ACS-approved departments normally are re-evaluated at five-year intervals. There were 572 colleges and universities on the approved list at the end of 1983. During the year, the committee studied the chemistry programs of 182 of the approved schools and of 20 schools applying for ACS approval. Each evaluation involved a review of extensive documentary materials submitted by the department chair describing the status of the program.

During 1983 eight chemistry programs were newly approved by the

Fall 1982 grad student enrollments in departments whose undergraduate chemistry programs are ACS approved

	Number of departments	First-year graduate students		All graduate students	
		Full time	Part time	Full time	Part time
M.S. departments[a]	131	494	310	1,075	1048
Ph.D. departments	189	3412	306	13,488	1483
TOTAL	**320**	**3906**	**616**	**14,563**	**2531**

a Departments whose highest offering is the master's degree in chemistry

Summary of totals from 1983 reports from approved programs

	Schools reporting	Men	Women	Total
CHEMISTRY				
Bachelors, total	570	6731	3312	10,043
Certified		2842	1391	4,233
Noncertified		3889	1921	5,810
Masters	320	1125	444	1,569
Doctorates	189	1459	300	1,759
CHEMICAL ENGINEERING				
Bachelors,				
certified	122	5409	1612	7,021
Masters	116	1153	164	1,317
Doctorates	101	314	19	333

Committee members, 1983

Henry A. Bent, *chairman*
North Carolina State University
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Harvey Mudd College
Marjorie C. Caserio
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Northwestern University
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Bell Telephone Laboratories
Bonnie R. Blaser, *secretary*
Mairin B. Brennan, *staff associate*
American Chemical Society

committee and four approved programs were put on probation. No departments were removed from the approved list in 1983.

During the past several years the committee has been involved in revising its guidelines for evaluating undergraduate chemistry programs, and comments and suggestions on several drafts of this revision were requested from the ACS-approved schools, the ACS divisions, the committee's visiting associates, and other interested individuals. After receiving many suggestions, not all of them compatible with each other, the committee completed its work on this revision, and the new guidelines were published in October 1983.

To determine why chemistry faculty members leave for other positions, especially nonacademic ones, the committee conducted a survey in 1980 on faculty mobility the past 10 years (1970–79) in ACS-approved departments. To identify trends, followup surveys were conducted for 1980, 1981, and 1982. The committee plans to review the results from these surveys, as well as from the 1983 survey (for which data are being collected this spring and summer) to determine whether any noteworthy trends are indicated.

The 1983 ACS Directory of Graduate Research included for the first time programs in polymer science and clinical chemistry in addition to the chemistry, chemical engineering, biochemistry, and pharmaceutical/medicinal chemistry programs included in previous editions. This biennial publication of the committee provides guidance information for students who are considering graduate education in chemistry and related fields. The directory includes M.S. and Ph.D. degree-granting departments in the above specialties in the U.S. and Canada. Included in each department's listing are biographical information on faculty members, their research interests, and titles of their publications for a two-year period.

Progress continued on the preparation of a computerized database that will consist of all information included in the 1983 directory as well as a multidimensional concordance of the research interests of the faculty members listed in this edition. It is expected that this database will be available on-line through a commercial vendor (Bibliographic Retrieval Services) later this spring.

The committee would like to acknowledge and thank the following visiting associates of the committee who conducted on-site visits to schools on the approved list or applying for ACS approval during 1983: David S. Breslow, Wilmington, Del.; David W. Brooks, University of Nebraska; Robert B. Carlin, Carnegie-Mellon University; Phillip L. Certain, University of Wisconsin, Madison; David M. Hercules, University of Pittsburgh; Ronald C. Johnson, Emory University; William R. Moomaw, Williams College; Robert A. Pierotti, Georgia Institute of Technology; Richard W. Ramette, Carleton College; Riley Schaeffer, University of New Mexico; and Richard C. Schoonmaker, Oberlin College.

Summary of data from approved programs, 1979–83

	Bachelors				Masters		Doctorates	
	Number of schools	Graduates (totals)	Certified graduates	Non-certified graduates	Number of schools	Graduates	Number of schools	Graduates
CHEMISTRY								
1979	551	10,451	4424	6027	323	1716	188	1532
1980	554	10,170	4170	6000	324	1698	188	1561
1981	558	10,453	4337	6116	323	1609	187	1613
1982	561	9,866	4179	5687	322	1645	187	1683
1983	570	10,043	4233	5810	320	1569	189	1759
CHEMICAL ENGINEERING[a]								
1979	112	4,977	4977	—	107	951	92	237
1980	109	5,348	5348	—	105	974	88	243
1981	110	5,831	5831	—	106	1020	87	250
1982	113	5,963	5963	—	109	1171	92	293
1983	122	7,021	7021	—	116	1317	101	333

a Chemical engineering departments are not required to report their data to CPT, so the number of departments included in this category varies from year to year. **Note:** Bachelor's degree projections for 1984: 570 chemistry departments report that they expect a total of 10,819 bachelor's degree graduates with majors in chemistry during the 1983–84 academic year, and 122 chemical engineering departments report that they expect a total of 7364 bachelor's degree graduates with majors in chemical engineering.

Chemistry and chemical engineering degrees awarded by approved schools, 1982–83

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Abilene Christian U	6	2	4	—	—	—	—
Adelphi U	2	8	0	—	—	—	—
Agnes Scott C	6	0	—	—	—	—	—
Akron, U of	13	8	6	3	a	—	—
Alabama, U of							
University	4	17	2	6	42	6	2
Birmingham	4	6	2	1	—	—	—
Huntsville	3	3	2	—	—	—	—
Alaska, U of	7	1	1	—	—	—	—
Albion C	3	12	—	—	—	—	—
Albright C	8	15	—	—	—	—	—
Alfred U	9	0	—	—	—	—	—
Allegheny C	4	29	—	—	—	—	—
Alma C	2	8	—	—	—	—	—
American U	10	5	2	6	—	—	—
Amherst C	4	13	—	—	—	—	—
Andrews U	3	4	—	—	—	—	—
Appalachian State U	1	10	2	—	—	—	—
Arizona State U	28	12	0	14	43	7	0
Arizona, U of	28	6	22	24	30	6	0
Arkansas, U of							
Fayetteville	11	14	1	13	36	12	1
Little Rock	3	8	2	—	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Ashland C	0	2	—	—	—	—	—
Auburn U	2	33	3	2	81	5	2
Augsburg C	4	3	—	—	—	—	—
Augustana C (Illinois)	1	12	—	—	—	—	—
Augustana C (South Dakota)	1	7	—	—	—	—	—
Austin C	3	8	—	—	—	—	—
Baldwin-Wallace C	1	11	—	—	—	—	—
Ball State U	5	1	5	—	—	—	—
Barnard C	5	14	—	—	—	—	—
Bates C	10	7	—	—	—	—	—
Baylor U	9	20	3	2	—	—	—
Beloit C	0	20	—	—	—	—	—
Bemidji State U	3	4	—	—	—	—	—
Birmingham-Southern C	6	24	—	—	—	—	—
Bloomsburg U	2	4	—	—	—	—	—
Boston C	10	21	3	2	—	—	—
Boston U	9	20	5	5	—	—	—
Bowdoin C	5	32	—	—	—	—	—
Bowling Green State U	6	17	5	—	—	—	—
Bradley U	3	11	0	—	—	—	—
Brandeis U	2	13	3	11	—	—	—
Bridgeport, U of	3	0	5	—	—	—	—
Bridgewater State C	2	12	0	—	—	—	—
Brigham Young U	19	28	3	4	51	8	1
Brown U	7	12	1	15	—	—	—
Bryn Mawr C	19	0	1	1	—	—	—
Bucknell U	14	12	3	—	23	5	—
Butler U	3	9	3	—	—	—	—
California Institute of Tech	7	8	6	25	13	6	5
California Polytechnic State U	9	30	0	—	—	—	—
California State C							
Bakersfield	7	2	—	—	—	—	—
San Bernardino	2	7	—	—	—	—	—
Stanislaus	1	0	—	—	—	—	—
California State Polytechnic U	7	3	4	—	45	—	—
California State U							
Chico	1	12	—	—	—	—	—
Dominguez Hills	3	4	—	—	—	—	—
Fresno	6	7	4	—	—	—	—
Fullerton	10	11	4	—	—	—	—
Hayward	8	13	1	—	—	—	—
Long Beach	9	23	18	—	46	—	—
Los Angeles	10	1	3	—	—	—	—
Northridge	8	15	4	—	—	—	—
Sacramento	8	4	8	—	—	—	—
California, U of							
Berkeley	60	4	12	58	141	23	16
Davis	37	8	6	19	59	16	3
Irvine	12	40	8	10	—	—	—
Los Angeles	44	65	11	28	—	—	—
Riverside	19	2	11	11	—	—	—
San Diego	59	0	18	28	—	—	—
Santa Barbara	24	9	6	13	35	5	2
Santa Cruz	30	15	5	6	—	—	—
Calvin C	5	5	—	—	—	—	—
Canisius C	7	8	—	—	—	—	—
Capital U	0	4	—	—	—	—	—
Carleton C	2	30	—	—	—	—	—
Carnegie-Mellon U	27	0	8	4	77	11	10
Carroll C	2	7	—	—	—	—	—
Carthage C	1	4	—	—	—	—	—
Case Western Reserve U	9	36	8	10	40	8	2
Catholic U of America	1	1	0	2	a	—	—
Centenary C of Louisiana	0	5	—	—	—	—	—
Central C	0	9	—	—	—	—	—
Central Connecticut State U	3	0	3	—	—	—	—
Central Florida, U of	12	0	3	—	—	—	—
Central Michigan U	3	14	10	—	—	—	—
Central State U (Ohio)	2	1	—	—	—	—	—
Central State U (Oklahoma)	1	15	—	—	—	—	—
Charleston, C of	10	5	—	—	—	—	—
Chatham C	1	1	—	—	—	—	—
Chestnut Hill C	5	4	—	—	—	—	—
Chicago, U of	4	26	3	23	—	—	—
Cincinnati, U of	19	0	17	24	58	9	1
Citadel, The	0	12	—	—	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
City U of New York							
Graduate Center	—	—	—	12	—	—	—
Brooklyn C	0	34	0	—	—	—	—
City C	1	12	3	—	a	—	—
Herbert H. Lehman C	2	7	—	—	—	—	—
Hunter C	2	5	—	—	—	—	—
Queens C	2	17	4	—	—	—	—
Clarion U of Pennsylvania	3	3	—	—	—	—	—
Clark U	15	3	1	1	—	—	—
Clarkson C of Tech	16	0	1	4	114	9	4
Clemson U	5	4	2	3	65	11	0
Cleveland State U	14	0	7	6	46	2	3
Coe C	1	8	—	—	—	—	—
Colby C	5	13	—	—	—	—	—
Colgate U	4	7	—	—	—	—	—
Colorado C	9	2	—	—	—	—	—
Colorado School of Mines	7	0	9	5	90	6	1
Colorado State U	11	8	2	13	23	4	0
Colorado, U of							
Boulder	25	39	4	21	72	9	2
Denver	2	12	1	—	—	—	—
Columbia U	9	0	17	20	42	36	6
Concordia C	1	10	—	—	—	—	—
Connecticut, U of	12	24	6	1	59	6	2
Cooper Union[b]	—	—	—	—	25	1	—
Cornell C	0	11	—	—	—	—	—
Cornell U	27	26	45	23	78	23	6
Creighton U	5	39	4	—	—	—	—
Dartmouth C	0	24	0	6	—	—	—
David Lipscomb C	0	15	—	—	—	—	—
Davidson C	9	4	—	—	—	—	—
Dayton, U of	11	3	1	—	32	5	—
Delaware State C	2	1	—	—	—	—	—
Delaware, U of	35	17	4	7	77	10	8
Delaware Valley C of Science & Agriculture	5	0	—	—	—	—	—
Delta State U	1	6	—	—	—	—	—
Denison U	3	5	—	—	—	—	—
Denver, U of	6	7	2	0	—	—	—
DePaul U	0	0	5	—	—	—	—
DePauw U	4	8	—	—	—	—	—
Detroit, U of	6	4	3	1	a	—	—
Dickinson C	4	10	—	—	—	—	—
Drake U	4	7	—	—	—	—	—
Drew U	1	7	—	—	—	—	—
Drexel U	14	0	9	4	75	4	1
Duke U	16	60	1	13	—	—	—
Duquesne U	0	2	11	3	—	—	—
Earlham C	3	7	—	—	—	—	—
East Carolina U	6	9	0	—	—	—	—
East Stroudsburg State U	7	15	0	—	—	—	—
East Tennessee State U	6	9	2	—	—	—	—
East Texas State U	3	2	10	—	—	—	—
Eastern Illinois U	6	3	6	—	—	—	—
Eastern Kentucky U	4	13	1	—	—	—	—
Eastern Michigan U	4	26	7	—	—	—	—
Elizabethtown C	0	13	—	—	—	—	—
Elmhurst C	3	15	—	—	—	—	—
Emory U	9	97	11	3	—	—	—
Emporia State U	5	3	2	—	—	—	—
Evansville, U of	3	3	—	—	—	—	—
Fairfield U	6	4	—	—	—	—	—
Fairleigh Dickinson U							
Madison	2	10	7	—	—	—	—
Rutherford	2	0	2	—	—	—	—
Teaneck	6	0	4	—	—	—	—
Fisk U	11	0	4	—	—	—	—
Florida Atlantic U	8	28	3	1	—	—	—
Florida Institute of Tech	1	0	0	—	—	—	—
Florida State U	12	22	4	11	—	—	—
Florida, U of	13	58	12	27	90	10	4
Fordham U	0	14	5	1	—	—	—
Fort Lewis C	2	6	—	—	—	—	—
Franklin & Marshall C	11	8	—	—	—	—	—
Furman U	18	0	3	—	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Geneva C	0	3	—	—	—	—	—
George Mason U	9	7	—	—	—	—	—
George Washington U	4	13	1	1	—	—	—
Georgetown U	19	0	11	6	—	—	—
Georgia Institute of Tech	20	0	7	5	155	20	1
Georgia State U	2	1	6	—	—	—	—
Georgia, U of	8	55	12	15	—	—	—
Gettysburg C	2	5	—	—	—	—	—
Glassboro State C	13	4	—	—	—	—	—
Gonzaga U	3	4	—	—	—	—	—
Goucher C	2	12	—	—	—	—	—
Grand Valley State C	0	9	—	—	—	—	—
Grinnell C	2	17	—	—	—	—	—
Gustavus Adolphus C	8	11	—	—	—	—	—
Hamilton C	0	10	—	—	—	—	—
Hamline U	7	1	—	—	—	—	—
Hampden-Sydney C	5	7	—	—	—	—	—
Hampton Institute	5	2	1	—	—	—	—
Hartford, U of	2	6	0	—	—	—	—
Hartwick C	4	1	—	—	—	—	—
Harvard U	0	26	9	27	—	—	—
Harvey Mudd C	13	0	—	—	—	—	—
Haverford C	3	11	—	—	—	—	—
Hawaii, U of	16	4	2	1	—	—	—
Hiram C	10	6	—	—	—	—	—
Hobart & William Smith C	2	12	—	—	—	—	—
Hofstra U	10	2	—	—	—	—	—
Hollins C	0	1	—	—	—	—	—
Holy Cross, C of the	29	16	—	—	—	—	—
Hope C	15	28	—	—	—	—	—
Houston, U of	19	2	7	13	47	47	9
Howard U	3	28	5	6	18	—	—
Humboldt State U	4	4	—	—	—	—	—
Idaho State U	5	2	0	—	—	—	—
Idaho, U of	6	6	2	6	13	14	0
Illinois Benedictine C	8	0	—	—	—	—	—
Illinois Institute of Tech	4	0	5	2	a	—	—
Illinois State U	41	1	3	—	—	—	—
Illinois, U of							
Chicago	13	22	26	5	65	9	0
Urbana-Champaign	51	62	18	66	125	24	13
Illinois Wesleyan U	0	5	—	—	—	—	—
Indiana State U	12	1	1	—	—	—	—
Indiana U							
Bloomington	28	92	12	29	—	—	—
South Bend	2	4	—	—	—	—	—
Indiana U of Pennsylvania	9	3	4	—	—	—	—
Indiana U-Purdue U							
Fort Wayne	2	3	—	—	—	—	—
Indianapolis	3	17	7	—	—	—	—
Iowa State U	12	1	5	22	58	6	4
Iowa, U of	8	2	5	4	19	7	1
Ithaca C	4	6	—	—	—	—	—
Jackson State U	6	3	0	—	—	—	—
James Madison U	1	16	—	—	—	—	—
John Carroll U	8	22	0	—	—	—	—
Johns Hopkins U	16	0	10	9	—	—	—
Juniata C	2	16	—	—	—	—	—
Kalamazoo C	5	17	—	—	—	—	—
Kansas State U	5	5	5	8	36	4	3
Kansas, U of	8	18	2	7	49	5	4
Kean C of New Jersey	2	16	—	—	—	—	—
Kearney State C	1	5	—	—	—	—	—
Kent State U	7	13	1	8	—	—	—
Kentucky, U of	4	13	7	6	51	5	2
Kenyon C	12	5	—	—	—	—	—
King's C	3	4	—	—	—	—	—
Knox C	4	22	—	—	—	—	—
Lafayette C	11	9	—	—	37	—	—
Lake Forest C	1	8	—	—	—	—	—
Lamar U	6	1	2	—	32	4	0
LaSalle C	10	6	—	—	—	—	—
Lawrence Institute of Tech	11	0	—	—	—	—	—
Lawrence U[c]	3	8	11	2	—	—	—
Lebanon Valley C	4	1	—	—	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Lehigh U	19	0	4	8	85	25	3
LeMoyne C	4	0	—	—	—	—	—
Lincoln U	0	8	—	—	—	—	—
Long Island U							
Brooklyn Center	3	3	5	—	—	—	—
C. W. Post C	8	4	—	—	—	—	—
Loras C	3	5	—	—	—	—	—
Louisiana State U							
Baton Rouge	6	3	2	11	81	6	6
Shreveport	4	0	—	—	—	—	—
Louisiana Tech U	0	3	4	—	28	3	1
Louisville, U of	7	19	1	1	28	18	0
Lowell, U of	9	2	3	3	47	3	—
Loyola C	5	1	—	—	—	—	—
Loyola M[illegible]mount U	4	1	—	—	—	—	—
Loyola U[illegible]w Orleans	3	1	—	—	—	—	—
Loyola U[illegible] Chicago	11	14	2	2	—	—	—
Luther C	0	9	—	—	—	—	—
Macalester C	3	9	—	—	—	—	—
MacMurray C	0	2	—	—	—	—	—
Maine, U of	6	1	6	2	31	6	0
Manhattan C[d]	4	1	—	—	56	23	—
Manhattanville C	2	0	—	—	—	—	—
Mankato State U	7	9	0	—	—	—	—
Marietta C	2	1	—	—	—	—	—
Marist C	0	4	—	—	—	—	—
Marquette U	12	3	5	3	—	—	—
Marshall U	5	19	3	—	—	—	—
Maryland, U of							
Baltimore County	6	16	0	0	—	—	—
College Park	19	70	10	21	68	11	0
Massachusetts Institute of Tech	39	0	3	41	96	66	13
Massachusetts, U of	16	3	10	22	60	7	4
McMurry C	1	5	—	—	—	—	—
McNeese State U	4	3	1	—	—	—	—
Memphis State U	2	7	3	0	—	—	—
Mercer U	10	3	—	—	—	—	—
Merrimack C	11	0	—	—	—	—	—
Metropolitan State C	14	18	—	—	—	—	—
Miami U	30	37	3	6	—	—	—
Miami, U of	5	91	1	0	—	—	—
Michigan State U	27	15	13	33	76	11	4
Michigan Tech U	14	0	2	2	97	9	0
Michigan, U of							
Ann Arbor	75	0	20	17	124	38	6
Dearborn	10	11	—	—	—	—	—
Flint	2	7	—	—	—	—	—
Middle Tennessee State U	2	18	6	—	—	—	—
Middlebury C	1	7	0	—	—	—	—
Midwestern State U	2	6	—	—	—	—	—
Millersville U of Pennsylvania	5	4	—	—	—	—	—
Millsaps C	2	14	—	—	—	—	—
Minnesota, U of							
Duluth	14	9	6	—	—	—	—
Minneapolis	23	0	7	12	169	19	16
Mississippi C	0	11	—	—	—	—	—
Mississippi State U	2	2	0	0	65	4	0
Mississippi, U of	1	27	2	6	25	0	1
Missouri, U of							
Columbia	6	8	11	4	55	3	1
Kansas City	7	11	0	2	—	—	—
Rolla	9	0	6	3	74	18	4
St. Louis	11	12	4	0	—	—	—
Missouri Western State C	0	5	—	—	—	—	—
Monmouth C	1	6	—	—	—	—	—
Montana C of Mineral Science & Tech	1	1	3	—	—	—	—
Montana State U	6	9	3	11	60	9	2
Montana, U of	7	5	4	1	—	—	—
Montclair State C	2	18	6	—	—	—	—
Moorhead State U	3	4	—	—	—	—	—
Moravian C	3	3	—	—	—	—	—
Morehouse C[e]	3	0	6	1	—	—	—
Morgan State U	3	6	—	—	—	—	—
Mount Holyoke C	0	19	2	0	—	—	—
Mount Saint Vincent, C of[d]	1	2	—	—	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Muhlenberg C	3	17	—	—	—	—	—
Murray State U	5	14	6	—	—	—	—
Muskingum C	3	5	—	—	—	—	—
Nebraska, U of							
Lincoln	9	6	6	23	a	—	—
Omaha	8	3	—	—	—	—	—
Nebraska Wesleyan U	2	1	—	—	—	—	—
Nevada, U of							
Las Vegas	2	4	—	—	—	—	—
Reno	1	6	0	3	—	—	—
New Hampshire, U of	5	7	4	5	31	4	1
New Jersey Institute of Tech[b]	—	—	—	—	98	21	4
New Mexico Highlands U	0	2	1	—	—	—	—
New Mexico Institute of Tech	6	0	4	—	—	—	—
New Mexico State U	6	10	3	7	38	5	—
New Mexico, U of	11	7	6	8	35	8	4
New Orleans, U of	2	15	3	5	—	—	—
New York U	9	30	16	14	—	—	—
Niagara U	1	9	—	—	—	—	—
North Alabama, U of	3	12	—	—	—	—	—
North Carolina A&T State U	5	0	5	—	—	—	—
North Carolina Central U	0	3	2	—	—	—	—
North Carolina State U	14	9	5	9	108	10	2
North Carolina, U of							
Asheville	3	2	—	—	—	—	—
Chapel Hill	40	96	8	32	—	—	—
Charlotte	6	4	2	—	—	—	—
Greensboro	10	6	3	—	—	—	—
Wilmington	0	14	—	—	—	—	—
North Dakota State U	1	12	3	4	24	4	—
North Dakota, U of	0	2	1	1	—	—	—
North Texas State U	5	10	10	5	—	—	—
Northeast Louisiana U	4	0	2	—	—	—	—
Northeastern U	5	0	9	4	36	16	0
Northern Arizona U	9	37	0	—	—	—	—
Northern Colorado, U of	0	7	2	1	—	—	—
Northern Illinois U	10	11	9	8	—	—	—
Northern Iowa, U of	6	15	0	—	—	—	—
Northern Kentucky U	1	6	—	—	—	—	—
Northern Michigan U	2	14	1	—	—	—	—
Northwest Missouri State U	5	1	—	—	—	—	—
Northwestern State U of Louisiana	0	4	—	—	—	—	—
Northwestern U	20	14	26	19	51	18	7
Norwich U	0	0	—	—	—	—	—
Notre Dame, U of	8	16	8	11	76	9	2
Oakland U	9	5	0	—	—	—	—
Oberlin C	1	22	—	—	—	—	—
Occidental C	3	17	—	—	—	—	—
Ohio Northern U	3	10	—	—	—	—	—
Ohio State U	27	0	11	27	83	12	6
Ohio U	13	5	3	5	20	11	0
Ohio Wesleyan U	3	14	—	—	—	—	—
Oklahoma State U	4	5	3	7	62	20	10
Oklahoma, U of	12	17	5	3	63	11	1
Old Dominion U	3	4	7	—	—	—	—
Oregon State U	8	0	5	5	45	16	1
Oregon, U of	7	32	3	7	—	—	—
Pace U	0	5	—	—	—	—	—
Pacific Lutheran U	4	6	—	—	—	—	—
Pacific, U of the	2	11	2	1	—	—	—
Pennsylvania State U	2	5	6	23	216	23	2
Pennsylvania, U of	8	28	4	17	55	9	7
Philadelphia C of Pharmacy & Science	4	0	0	0	—	—	—
Philadelphia C of Textiles & Science	5	0	—	—	—	—	—
Pittsburg State U	7	2	0	—	—	—	—
Pittsburgh, U of	19	76	15	13	105	30	7
Polytechnic Institute of New York	10	1	5	9	38	24	3
Pomona C	8	3	—	—	—	—	—
Portland State U	1	10	3	4	—	—	—
Pratt Institute[b]	—	—	—	—	9	—	—
Princeton U	11	9	33	14	51	2	11
Providence U	7	1	0	0	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Puerto Rico, U of							
Mayaguez	13	11	2	—	61	2	0
Rio Piedras	25	34	2	2	—	—	—
Puget Sound, U of	5	0	—	—	—	—	—
Purdue U	29	21	9	34	146	18	6
Purdue U Calumet	1	2	—	—	—	—	—
Randolph-Macon Woman's C	2	5	—	—	—	—	—
Redlands, U of	0	1	—	—	—	—	—
Reed C	15	2	—	—	—	—	—
Regis C	1	5	—	—	—	—	—
Rensselaer Polytechnic Institute	34	0	11	6	104	14	4
Rhode Island, U of	6	2	2	5	26	4	0
Rice U	12	2	1	15	37	11	3
Richmond, U of	1	15	1	—	—	—	—
Rider C	4	0	—	—	—	—	—
Ripon C	2	4	—	—	—	—	—
Roanoke C	1	4	—	—	—	—	—
Rochester Institute of Tech	9	4	3	—	—	—	—
Rochester, U of	8	6	26	14	57	15	4
Rollins C	4	0	—	—	—	—	—
Roosevelt U	8	1	4	—	—	—	—
Rose-Hulman Institute of Tech	11	0	—	—	53	2	—
Russell Sage C	3	2	—	—	—	—	—
Rutgers U							
Camden C	8	7	—	—	—	—	—
New Brunswick	46	12	7	10	108	19	2
Newark C of Arts & Sciences	10	13	7	9	—	—	—
Saginaw Valley State C	2	9	—	—	—	—	—
St. Anselm C	1	4	—	—	—	—	—
St. Cloud State U	1	4	—	—	—	—	—
St. John Fisher C	12	0	—	—	—	—	—
St. John's U	8	3	3	—	—	—	—
St. Joseph C	2	1	1	—	—	—	—
St. Joseph's U	8	13	6	—	—	—	—
St. Lawrence U	11	19	—	—	—	—	—
St. Louis U	9	36	5	—	—	—	—
St. Mary's C	5	9	—	—	—	—	—
St. Michael's C	0	4	—	—	—	—	—
St. Olaf C	6	31	—	—	—	—	—
St. Peter's C	0	3	—	—	—	—	—
St. Thomas, C of	2	4	—	—	—	—	—
Salem State C	4	0	—	—	—	—	—
Sam Houston State U	11	0	4	—	—	—	—
San Diego State U	17	3	8	1	—	—	—
San Francisco State U	6	28	7	—	—	—	—
San Francisco, U of	5	5	5	—	—	—	—
San Jose State U	20	14	11	—	17	10	—
Santa Clara, U of	3	4	—	—	—	—	—
Scranton, U of	8	11	21	—	—	—	—
Seattle U	2	6	—	—	—	—	—
Seton Hall U	8	1	13	8	—	—	—
Shippensburg U	11	8	4	—	—	—	—
Siena C	12	0	—	—	—	—	—
Simmons C	8	1	—	—	—	—	—
Skidmore C	3	21	—	—	—	—	—
Slippery Rock State C	0	3	—	—	—	—	—
Smith C	2	4	0	0	—	—	—
Sonoma State U	0	13	—	—	—	—	—
South Carolina, U of	7	21	5	13	35	6	2
South Dakota School of Mines & Tech	12	2	5	—	29	5	—
South Dakota State U	0	28	3	—	—	—	—
South Dakota, U of	3	15	2	—	—	—	—
South Florida, U of	16	58	1	0	35	3	0
Southeast Missouri State U	0	6	—	—	—	—	—
Southeastern Louisiana U[f]	—	—	—	—	—	—	—
Southeastern Massachusetts U	6	2	1	—	—	—	—
Southern California, U of	17	7	2	20	32	11	0
Southern Colorado, U of[f]	—	—	—	—	—	—	—
Southern Illinois U							
Carbondale	1	17	2	6	—	—	—
Edwardsville	11	7	4	—	—	—	—
Southern Methodist U	7	18	2	—	—	—	—
Southern Mississippi, U of	2	17	4	3	—	—	—

	CHEMISTRY				CHEMICAL ENGINEERING		
	Bachelor's, certified						
	Yes	No	M.S.	Ph.D.	B.S.	M.S.	Ph.D.
Southern Oregon State C	0	4	—	—	—	—	—
Southern U & A&M C	6	0	1	—	—	—	—
Southwest Missouri State U	1	12	—	—	—	—	—
Southwest State U	1	8	—	—	—	—	—
Southwest Texas State U	20	3	4	—	—	—	—
Southwestern at Memphis	3	4	—	—	—	—	—
Southwestern Louisiana, U of	1	8	1	—	11	7	—
Southwestern Oklahoma State U	4	7	—	—	—	—	—
Stanford U	9	12	2	17	19	22	8
State U of New York							
Albany	25	3	3	2	—	—	—
Binghamton	4	36	1	5	—	—	—
Buffalo	9	13	6	12	78	9	3
Stony Brook	14	43	6	15	—	—	—
C at Brockport	5	1	—	—	—	—	—
C at Buffalo	6	6	2	—	—	—	—
C at Cortland	2	5	—	—	—	—	—
C at Fredonia	11	14	2	—	—	—	—
C at Geneseo	6	0	0	—	—	—	—
C at New Paltz	13	1	1	—	—	—	—
C at Oneonta	2	19	0	—	—	—	—
C at Oswego	12	0	0	—	—	—	—
C at Plattsburgh	6	14	0	—	—	—	—
C at Potsdam	3	19	—	—	—	—	—
Stephen F. Austin State U	5	12	2	—	—	—	—
Stetson U	2	3	—	—	—	—	—
Stevens Institute of Tech	8	0	14	3	—	—	—
Suffolk U	3	5	—	—	—	—	—
Susquehanna U	1	5	—	—	—	—	—
Swarthmore C	6	8	—	—	—	—	—
Syracuse U	23	7	4	4	22	5	0
Temple U	8	6	7	4	—	—	—
Tennessee Technological U	4	10	3	—	47	9	—
Tennessee, U of							
Chattanooga	10	19	—	—	—	—	—
Knoxville	5	13	4	8	73	11	5
Martin	5	5	—	—	—	—	—
Texas A&I U	2	0	2	—	21	9	—
Texas A&M U	30	13	4	29	158	10	1
Texas Christian U	1	10	2	4	—	—	—
Texas Southern U	21	0	7	—	—	—	—
Texas Tech U	16	9	4	4	41	9	1
Texas, U of							
Arlington	12	9	7	0	—	—	—
Austin	57	0	3	24	101	39	6
Dallas	6	2	0	—	—	—	—
El Paso	14	1	9	—	—	—	—
Texas Woman's U	2	4	0	2	—	—	—
Thiel C	1	5	—	—	—	—	—
Thomas More C	6	0	—	—	—	—	—
Toledo, U of	3	20	3	1	20	6	1
Towson State U	2	5	—	—	—	—	—
Trenton State C	11	0	—	—	—	—	—
Trinity C	9	9	0	—	—	—	—
Trinity U	0	4	0	—	—	—	—
Tri-State U[b]	—	—	—	—	a	—	—
Tufts U	0	26	4	0	37	4	1
Tulane U of Louisiana	2	10	1	2	28	5	0
Tulsa, U of	1	0	—	—	a	—	—
Tuskegee Institute	0	4	1	—	—	—	—
Union C	6	12	0	—	—	—	—
U.S. Air Force Academy	6	4	—	—	—	—	—
U.S. Naval Academy	17	0	—	—	—	—	—
Ursinus C	9	16	—	—	—	—	—
Utah State U	5	0	0	8	—	—	—
Utah, U of	4	25	3	9	a	—	—
Valparaiso U	4	38	—	—	—	—	—
Vanderbilt U	3	22	2	9	31	4	1
Vassar C	2	2	0	—	—	—	—
Vermont, U of	27	0	5	3	—	—	—
Villanova U	9	0	14	7	38	6	—
Virginia Commonwealth U	14	38	3	2	—	—	—
Virginia Military Institute	13	0	—	—	—	—	—
Virginia Polytechnic Institute & State U	14	14	10	6	79	5	3
Virginia, U of	3	69	4	4	49	28	3
Wabash C	7	11	—	—	—	—	—
Wagner C	0	7	—	—	—	—	—
Wake Forest U	3	9	0	0	—	—	—
Washburn U of Topeka	1	2	—	—	—	—	—
Washington C	2	0	—	—	—	—	—
Washington and Jefferson C	2	27	—	—	—	—	—
Washington and Lee U	1	6	—	—	—	—	—
Washington State U	8	8	11	8	21	6	0
Washington U	9	7	4	3	40	3	6
Washington, U of	59	18	17	14	58	6	7
Wayne State U	20	23	7	9	50	19	5
Waynesburg C	0	0	—	—	—	—	—
Weber State C	3	7	—	—	—	—	—
Wellesley C	1	18	—	—	—	—	—
Wesleyan U	4	15	0	7	—	—	—
West Chester U	5	14	2	—	—	—	—
West Florida, U of	16	2	—	—	—	—	—
West Texas State U	0	13	2	—	—	—	—
West Virginia Institute of Tech	3	0	—	—	25	0	—
West Virginia State C	2	4	—	—	—	—	—
West Virginia U	9	38	1	3	43	9	0
Western Illinois U	4	5	1	—	—	—	—
Western Kentucky U	5	8	4	—	—	—	—
Western Maryland C	3	11	—	—	—	—	—
Western Michigan U	4	20	0	4	—	—	—
Western New England C	2	2	—	—	—	—	—
Western Washington U	13	12	6	—	—	—	—
Westminster C	0	8	—	—	—	—	—
Wheaton C (Illinois)	5	15	—	—	—	—	—
Wheaton C (Massachusetts)	1	6	—	—	—	—	—
Wheeling C	0	1	—	—	—	—	—
Whitman C	3	5	—	—	—	—	—
Whittier C	3	3	—	—	—	—	—
Wichita State U	9	3	6	0	—	—	—
Widener U	3	0	—	—	—	—	—
Wilkes C	7	4	—	—	—	—	—
Willamette U	2	7	—	—	—	—	—
William Paterson C of New Jersey	0	6	—	—	—	—	—
William and Mary, C of	32	2	2	—	—	—	—
Williams C	4	17	—	—	—	—	—
Wisconsin, U of							
Eau Claire	3	10	—	—	—	—	—
Green Bay	0	10	—	—	—	—	—
La Crosse	2	11	—	—	—	—	—
Madison	12	14	4	37	120	13	11
Milwaukee	2	13	3	2	—	—	—
Oshkosh	10	3	0	—	—	—	—
Parkside	1	6	—	—	—	—	—
Platteville	0	2	—	—	—	—	—
River Falls	11	6	—	—	—	—	—
Stevens Point	9	7	—	—	—	—	—
Superior	0	3	—	—	—	—	—
Wittenberg U	2	6	—	—	—	—	—
Wooster, C of	5	25	—	—	—	—	—
Worcester Polytechnic Institute	3	6	2	2	48	7	2
Wright State U	16	20	14	—	—	—	—
Wyoming, U of	1	5	6	4	18	6	0
Xavier U	9	9	2	—	—	—	—
Xavier U of Louisiana	1	17	—	—	—	—	—
Yale U	10	0	26	26	—	—	—
Youngstown State U	6	50	5	—	23	—	—
TOTALS	4233	5810	1569	1759	7021	1317	333

a Data not submitted. b Listed on basis of accreditation by AIChE-ABET. c Master's and Ph.D. degrees given by the Institute of Paper Chemistry. d The chemistry programs at Mount Saint Vincent and Manhattan College are integrated into a combined department with all instruction in chemistry located at Manhattan College. e Master's degrees given by Atlanta University. f Added in 1983. **Note:** For brevity, "B.S." and "M.S." are used to denote all bachelor's and master's degrees, respectively, in each column.